Robust Summary
Partition Coefficient

201-15728B

Test Substance:

Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil

CAS Number:	CAS Inventory Name:
68513-69-9	Residues, petroleum, steam-cracked light
64741-62-4	Clarified oils, petroleum, catalytic cracked
69013-21-4	Fuel oil, pyrolysis
8002-05-9	Petroleum

In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.

Method/Guideline: EEC A8 / OECD 117

Year (guideline): 1992 / 1989

Type (test type): N-Octanol/Water Partition Coefficient (HPLC method)

GLP: Yes

Year (study performed): 2004

Temperature: 25 Deg C

Log P_{ow} Value: 3.4 - 5.0

Test Conditions:

- **Note: Concentration prep., vessel type, replication, test conditions.**

Test substance was evaluated at a concentration of 118 mg/L in a mixture of methanol:tetrahydrofuran:water (65:10:25). HPLC analysis was performed on a Hewlett Packard 1050 Liquid Chromatograph with a Luna 5um C8 (15cm x 3mm id) column with a 1 mL/min flow rate (methanol:water (3:1) mobile phase), 10uL injection volume and UV detection at 210 nm. Six reference compounds (with known log P_{ow} values) at concentrations ranging from approximately 42 to 109 mg/L, were analyzed in a combined solution including nitrobenzene (log P_{ow} =1.9), ethylbenzoate (log P_{ow} = 2.6), bromobenzene (log P_{ow}=3.0), benzylbenzoate (log P_{ow}=4.0), triphenylamine (log P_{ow}=5.7) and DDT (log P_{ow}=6.2). Additionally, an unretained standard of 4,5-dihydroxynaphthalene-2,7-disulphonic acid, disodium salt was analyzed to determine the system deadtime.

Two sets of reference mixture and test substance runs were performed.

Results:

Units/Value:

Multiple components detected with Log P_{ow} values between 3.4 and 5.0 (calculated from the mean exponential regression of reference compounds).

Reliability: (1) Reliable without restriction

Reference: Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Heavy Pyrolysis Fuel Oil. Study EXN077/042053.

Other (source): Olefins Panel, American Chemistry Council

Robust Summary
Biodegradation

Test Substance:	Industry Stream Name : Heavy Pyrolysis Fuel Oil CAS Number — CAS Inventory Name 68513-69-9 — Residue, petroleum, steam-cracked light 64741-62-4 — Clarified oils, petroleum, catalytic cracked 69013-21-4 — Fuel oil, pyrolysis 8002-05-9 — Petroleum In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.
Method/Guideline:	OECD Guideline 301F
Year (guideline):	1992
Type (test type):	Ready Biodegradability: Manometric Respirometry Test
GLP (Y/N):	Yes
Year (study performed):	2003
Inoculum:	Domestic activated sludge
Exposure Period:	28 Days
Test Conditions: • **Note: Concentration preparation, vessel type, replication, test conditions.**	Triplicate test systems were used to evaluate the biodegradability of the test and positive control substances at mean concentrations of 50 mg/L and 51 mg/L, respectively. Blank test systems, which did not contain the test or positive control substance, were run concurrently in triplicate. The total suspended solids (TSS) of the activated sludge was determined to be 3.32 g/L. The inoculum was added at a 1% loading volume of sludge supernatant to test medium. The microbial count of the inoculum was 10^5 CFU/mL. One liter of test medium, which was aerated for 24 hours with carbon dioxide free air, was added to each one liter respirometer flask. The test substance was administered by direct addition on glass fiber filters into the test medium. The test system was sealed immediately after addition of the test substance. An aliquot of the positive control stock solution was added to the appropriate test flasks.

Test Conditions (cont'd): **Note: Concentration preparation, vessel type, replication, test conditions.**	An unacclimated activated sludge inoculum was used in this study. The inoculum was obtained from the Clinton Sanitary Wastewater Treatment Plant, Annandale, NJ, USA. The treatment plant receives domestic sewage. All test systems were placed on a Coordinated Environmental Services (CES) automated respirometer which automatically recorded the oxygen uptake in general agreement with the OECD guideline. The 28-day study was conducted at a temperature range of 22 ± 1°C °C.
Results: **Units/Value:** **Note: Deviations from protocol or guideline analytical method.**	Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test substance as calculated using results of an elemental analysis of the test substance. By day 14, >60% biodegradation of positive control was observed, which meets the guideline requirement. No deviations from the protocol occurred that affected the integrity of the study data. The test substance biodegraded to 29% and cannot be considered readily biodegradable. Sample — % Degradation* (day 28) — Mean % Degradation (day 28) Test Substance — 33, 31, 22 — 29 Na Benzoate — 91, 87, 89 — 89 * replicate data
Conclusion:	Not readily biodegradable
Reliability:	(1)-Reliable without restriction.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2003. Ready Biodegradability: Manometric Respirometry test. Study # 176894A
Other (source): (FT - SO)	Olefins Panel, American Chemistry Council

Robust Summary
Boiling Point

Test Substance:

Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil

CAS Number:	CAS Inventory Name:
68513-69-9	Residues, petroleum, steam-cracked light
64741-62-4	Clarified oils, petroleum, catalytic cracked
69013-21-4	Fuel oil, pyrolysis
8002-05-9	Petroleum

In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.

Method/Guideline: EEC A2 / OECD 103

Year (guideline): 1992 / 1995

Type (test type): Boiling Point (distillation method)

GLP: Yes

Year (study performed): 2004

Pressure Corrected to Standard Atmospheric (test performed at 992 mBar)

Boiling Point Value: 201 - 340 Deg C

Test Conditions:

- **Note: Concentration prep., vessel type, replication, test conditions.**

Test substance added to distillation flask and heated at a rate which resulted in initial drops of distillate condensing after 10-15 minutes. On boiling, the heating rate was adjusted in order that the distillation rate was approximately 3 mL/min. The rate decreased as the higher boiling components distilled. Procedure performed in duplicate.

Results:

Units/Value:

Results of duplicate measurements:

Run I	initial B.P. 201 Deg C	final B.P. 339 Deg C
Run II	initial B.P 201 Deg C	final B.P. 341 Deg C

Mean 201 - 340 Deg C

Approximately 80% of the test substance distilled over this temperature range, the remainder decomposing at high temperatures. The remaining material formed a hard gray/black mass in the distillation flask indicative of decomposition.

Reliability: (1) Reliable without restriction

Reference: Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Heavy Pyrolysis Fuel Oil. Study EXN077/042053.

Other (source): Olefins Panel, American Chemistry Council

Robust Summary
Invertebrate Acute Toxicity

Test Substance:	Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil CAS Number: / CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 64741-62-4 Clarified oils, petroleum, catalytic cracked 69013-21-4 Fuel oil, pyrolysis 8002-05-9 Petroleum In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.
Method/Guideline:	OECD Guideline 202
Year (guideline):	1984
Type (test type):	Daphnid Acute Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Daphnia magna* Straus
Analytical Monitoring:	Yes
Exposure Period:	48 hours
Statistical Method:	The 24-hour EL_{50} and EC_{50} values were determined using a Trimmed Spearman-Karber Method (Hamilton et al.,1977). A Binomial Method (Stephan, 1977) was used to determine the 48-hour EL_{50} and EC_{50} values. Hamilton, M., R. Russo, R. Thurston, 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays. *Environmental Science and Technology*, Vol. 11, No. 7, p.714-719. Stephan, C. E., Methods for Calculating an LC_{50}, *Aquatic Toxicology and Hazard Evaluation, ASTM STP 634*, F. L. Mayer and J. L. Hamelink, Eds., American Society for Testing and Materials, 1977, pp. 65-84.
Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 4.0 L of reconstituted water in glass aspirator bottles (capacity 4.5 L). The solutions were mixed for 24 hours using a 5% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into four replicates of approximately 140 mL in 125 mL Erlenmeyer flasks (no headspace). Five daphnids were added to each replicate and the replicates were closed. The test was performed under static conditions with no aeration. Mean test temperature: 20.1°C (S.D. = 0.1), diurnal light: approximately 16 hours light and 8 hours dark with 100 to 113 lux during full daylight periods. Dissolved oxygen ranged from 8.0 to 8.6 mg/L and pH ranged from 7.8 to 8.1 during the study. Water hardness was 134 mg/L as $CaCO_3$. The Daphnids were cultured in-house. Age was <24 hours old from 13-day old parents.

	Due to the relatively complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. The initial concentration of the test substance was not maintained at 80% in the lowest loading rate throughout the test, 74% of the initial concentration was maintained. It was deemed more appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing than to prepare dilutions of a stock solution.
Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	Effect Loading (EL_{50}) / Effect Concentration (EC_{50}) Values (mg/L) EL_{50} EC_{50} 24 hours 3.7 (3.3-4.2*) 3.0 (2.7-3.4*) 48 hours 3.3 (2.3-4.8**) 2.7 (1.8-4.1**) * 95% Confidence Interval ** 99% Confidence Interval The maximum actual loading rate causing no immobilization after 48-hours was 2.3 mg/L. The minimum actual loading rate causing 100% immobilization after 48 hours was 4.8 mg/L. The maximum measured concentration causing no immobilization after 48-hours was 1.8 mg/L. The minimum measured concentration causing 100% immobilization after 48-hours was 4.1 mg/L. The method of analysis was gas chromatography with flame ionization detection (HS GC-FID). Loading Rate (mg/L) / Measured Conc. (mg/L) / % Immobilization 24-hour / % Immobilization 48-hour Control 0 0 0 0.50 0.18 0 0 1.0 1.6 0 0 2.3 1.8 0 0 4.8 4.1 85 100 10 7.8 100 100
Conclusion:	After *Daphnia magna* were exposed to WAFs prepared from Heavy Pyrolysis Fuel Oil for 48-hours, the EL_{50} was 3.3 mg/L and the EC_{50} was 2.7 mg/L.
Reliability:	1-Reliable without restrictions.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. *Daphnia sp.*, ACUTE IMMOBILIZATION TEST on HEAVY PYROLYSIS FUEL OIL. Study # 176842
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Fish, Acute Toxicity

Test Substance:	Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil CAS Number: / CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 64741-62-4 Clarified oils, petroleum, catalytic cracked 69013-21-4 Fuel oil, pyrolysis 8002-05-9 Petroleum In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.
Method/Guideline:	OECD Guideline 203
Year (guideline):	1992
Type (test type):	Fish Acute Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Oncorhynchus mykiss*
Analytical Monitoring:	Yes
Exposure Period:	96 hours
Statistical Method:	The 24 - 96 hour LL_{50} and LC_{50} values were determined using a Trimmed Spearman-Karber Method (Hamilton et al.,1977). Hamilton, M., R. Russo, R. Thurston, 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays. *Environmental Science and Technology*, Vol. 11, No. 7, p.714-719.
Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 18 L of reconstituted water in glass aspirator bottles (capacity 22 L). The solutions were mixed for 24 hours using a 3% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into three replicates of approximately 4.5 L in 4 L size aspirator bottles (no headspace). Four fish were added to each replicate and the replicates were closed with foil covered neoprene stoppers. Daily renewals were performed by removing ~90% of the test solution through the outlet at the bottom of the aspirator bottle and refilling with fresh solution. The fish were received from Thomas Fish Company, Anderson, CA. The fish were not fed during the study. They were held for 12 days in study dilution water prior to use and were 36 days old at the start of the study. Fish mean weight = 0.194 g, mean total length = 3.1 cm, test loading = 0.172 g of fish/L. Mean test temperature: 13.6°C (S.D. = 0.1), diurnal light: approximately 16 hours light and 8 hours dark with 644 to 653 Lux during full daylight periods. Dissolved oxygen ranged from 6.7 to 8.5 mg/L and pH ranged from 6.5 to 8.0 during the study. Water hardness was 98 mg/L as $CaCO_3$.

	Due to the complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. It was deemed more appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing than to prepare dilutions of a stock solution. The protocol required that the fish would be held at test temperature (13-15°C) for at least 7 days prior to use in the test The fish were held at 12.8°C for the 7 days prior to use in the study. This deviation is not believed to have affected the outcome or integrity of the study.
Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	The maximum actual loading rate causing no mortality after 96-hours was 2.6 mg/L. The maximum measured concentration causing no mortality after 96-hours was 2.5 mg/L. The minimum actual loading rate causing 100% mortality after 96-hours was 11 mg/L. The minimum measured concentration causing 100% mortality after 96-hours was 9.1 mg/L. The method of analysis was gas chromatography with flame ionization detection (GC-FID). Lethal Loading (LL_{50}) / Lethal Concentration (LC_{50}) Values (mg/L) LL_{50} LC_{50} 3 & 6 hours >11* >9.1* 24 hours 7.5 (6.7-8.4) 5.8 (5.2-6.4) 48 hours 5.9 (4.8-7.3) 4.7 (3.9-5.6) 72 & 96 hours 5.6 (4.5-6.9) 4.4 (3.7-5.3) * Not a calculated value, no mortality was observed in the highest loading rate/concentration at 3 hours, 42% mortality was observed in the highest loading rate/concentration at 6 hours therefore the EL/EC_{50} is greater than the highest loading rate/concentration tested. Values in parentheses are 95% confidence intervals Summary of In-Life observations - % Mortality Loading Rate (mg/L) Control 0.63 1.4 2.6 5.8 11 Meas. Conc. (mg/L) 0 0.30 1.2 2.5 4.1 9.1 3 hours 0 0 0 0 0 0 6 hours 0 0 0 0 0 42 24 hours 0 0 0 0 8 100 48 hours 0 0 0 0 42 100 72 & 96 hours 0 0 0 0 58 100
Conclusion:	After *Oncorhynchus mykiss* were exposed to WAFs prepared from Heavy Pyrolysis Fuel Oil for 96-hours, the LL_{50} was 5.6 mg/L and the LC_{50}. was 4.4 mg/L.
Reliability:	1-Reliable without restrictions.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. FISH, ACUTE TOXICITY TEST on HEAVY PYROLYSIS FUEL OIL. Study # 176858
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Alga Toxicity

Test Substance:	Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil CAS Number: / CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 64741-62-4 Clarified oils, petroleum, catalytic cracked 69013-21-4 Fuel oil, pyrolysis 8002-05-9 Petroleum In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.
Method/Guideline:	OECD Guideline 201
Year (guideline):	1984
Type (test type):	Alga Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Pseudokirchneriella subcapitata*
Analytical Monitoring:	Yes
Exposure Period:	96 hours
Statistical Method:	The E_bC_{50}, E_rC_{50} and confidence intervals for inhibition of growth/growth rate slope were determined by a probit regression calculation of the probit of the growth inhibition/growth rate slope vs the log of the concentration and associated confidence intervals based on the methods of D. J. Finney (Finney, 1971). Calculations were based on the PROC PROBIT procedure of SAS (SAS, 2002). The NOEC for the E_bC_{50} and E_rC_{50} was based on Multiple Range tests (Duncan, 1975) and (Dunnett, 1964), determined from the GLM procedure of SAS (SAS, 2002). The Shapiro-Wilk (Shapiro-Wilk, 1965) test for normality was used to test if the assumption of normality of the residuals was met; since the residuals were normally distributed the NOEC was based on the estimated values. Finney, D.J. 1971. Probit Analysis, 3rd Edition, London: Cambridge University Press. SAS Version 8, SAS Institute, Inc., Cary, NC. 2002. Duncan, D.B. 1975, "t-Tests and Intervals for Comparisons Suggested by the Data", Biometrics, 31, 339-359. Dunnett, C. 1964, "New Tables for Multiple Comparisons With A Control", Biometrics, Vol 20, No. 3, pg 482-491. Shapiro, S.S. and Wilk, M.B. 1965,"n analysis of variance test for normality (complete samples)" Biometrika, 52, pg 591-611.

Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 2.0 L of algal nutrient medium augmented with sodium bicarbonate in glass aspirator bottles (capacity 2.3 L). The solutions were mixed for 24.5 hours using an 7% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into 12 replicates of approximately 140 mL in 125 mL Erlenmeyer flasks (no headspace) containing two 14 mm glass spheres to facilitate mixing. The test chambers were inoculated with algae (1.0×10^4 cells/mL) and were sealed with ground glass stoppers. Three replicates were sacrificed daily for cell density determination. The test chambers were placed on a shaker table (100 rpm) to keep the algae in suspension. The test was performed under static conditions with no aeration. The algae was cultured in-house from 5 day old stock cultures in log phase growth. Mean test temperature: 24.2°C (sd = 0.5). Continuous light: intensity was 8431 to 8595 Lux. The pH ranged from 7.4 to 7.6 in the test solutions at test initiation and ranged from 7.0 to 8.7 at test termination. Due to the complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. Test substance analysis was performed on samples of the WAFs at the start of the test (day 0) and at termination (day 4). The initial concentration of the test substance was not maintained at 80% in the three lower loading rates throughout the test (this may be due to biological activity or physical processes in the test chambers). It was appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing than to prepare dilutions of a stock solution. The test duration was 96 hours, instead of 72 hours. However, both 72 and 96-hour endpoints were determined. None of the above exceptions are believed to have affected the outcome, integrity, or quality of the study.
Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	Effects on growth rate (r) based upon actual loading rates: 72 hr ErL50 = 2.3 mg/L (CNC) 96 hr ErL50 = 2.1 mg/L (CNC) 72 and 96 hr NOELR = 0.39 mg/L Effects on biomass (b) based upon actual loading rates: 72 hr EbL50 = 1.5 mg/L (1.3-1.6 mg/L) 96 hr EbL50 = 1.4 mg/L (1.3-1.6 mg/L) 72 hr NOELR = 0.20 mg/L 96 hr NOELR = 0.39 mg/L Effects on growth rate (r) based upon measured concentrations: 72 hr ErC50 = 2.0 mg/L (CNC) 96 hr ErC50 = 1.8 mg/L (CNC) 72 and 96 hr NOEC = 0.42 mg/L Effects on biomass (b) based upon measured concentrations: 72 and 96 hr EbC50 = 1.3 mg/L (1.2-1.4 mg/L) 72 hr NOEC = 0.07 mg/L 96 hr NOEC = 0.42 mg/L Values in parentheses are 95% confidence intervals. CNC = Could Not Calculate

	The analytical method used was static headspace gas chromatography with flame ionization detection. Summary of In-Life observations - % Inhibition Loading Rate* (mg/L) Control 0.20 0.39 1.1 2.6 7.2 Meas. Conc.† (mg/L) 0 0.07‡ 0.42 1.1 2.1 6.4 Based on Growth Rate 72 hours n/a -2.0 0 11 83 97 96 hours n/a -1.7 -2.2 7.1 86 98 Based on Biomass 72 hours n/a -2.1 7.6 34 92 99 96 hours n/a -1.9 1.3 31 97 100 * Actual loading rate (weight) of test substance added to the vehicle/dilution water. † Concentration based on mean (Day 0 and Day 4) measured concentrations. ‡ Based on Day 0 only, since the Day 4 sample was below detection limits. Negative(-) value indicates a stimulatory effect.
Conclusions:	Effects on growth rate (r) based upon actual loading rates: 72 hr ErL50 = 2.3 mg/L 96 hr ErL50 = 2.1 mg/L Effects on biomass (b) based upon actual loading rates: 72 hr EbL50 = 1.5 mg/L 96 hr EbL50 = 1.4 mg/L Effects on growth rate (r) based upon measured concentrations: 72 hr ErC50 = 2.0 mg/L 96 hr ErC50 = 1.8 mg/L Effects on biomass (b) based upon measured concentrations: 72 and 96 hr EbC50 = 1.3 mg/L
Reliability:	(1)-Reliable without restriction
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. ALGA, GROWTH INHIBITION TEST on HEAVY PYROLYSIS FUEL OIL. Study # 176867.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Fish Acute Toxicity

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number / CAS Inventory Name 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	OECD Guideline 203
Year (guideline):	1992
Type (test type):	Fish Acute Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Oncorhynchus mykiss*
Analytical Monitoring:	Yes
Exposure Period:	96 hours
Statistical Method:	The 6-hour and 24-hour LL_{50} and LC_{50} values were determined using a maximum likelihood analysis based on D. J. Finney, 1971. A Trimmed Spearman-Karber Method (Hamilton et al.,1977) was used to determine the 48-hour, 72-hour and 96-hour LL_{50} and LC_{50} values. Finney, D.J., 1971. Probit Analysis, 3rd Edition, London: Cambridge University Press. Hamilton, M., R. Russo, R. Thurston, 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentrations in Toxicity Bioassays. *Environmental Science and Technology*, Vol. 11, No. 7, p.714-719.
Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 18 L of reconstituted water in glass aspirator bottles (capacity 22 L). The solutions were mixed for 24 hours using a 3% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into three replicates of 4.5 L in 4 L size aspirator bottles (no headspace). Four fish were added to each replicate and the replicates were closed with foil covered neoprene stoppers. Daily renewals were performed by removing ~90% of the test solution through the outlet at the bottom of the aspirator bottle and refilling with fresh solution. The fish were received from Thomas Fish Company, Anderson, CA. The fish were not fed during the study. They were held for 13 days in study dilution water prior to use and were 29 days old at the start of the study. Fish mean weight = 0.206 g, mean total length = 3.1 cm, test loading = 0.183 g of fish/L. Mean test temperature: 13.6°C (S.D. = 0.1), diurnal light: approximately 16 hours light and 8 hours dark with 607 to 614 Lux during full daylight periods. Dissolved oxygen ranged from 6.8 to 8.6 mg/L and pH ranged from 7.3 to 8.1 during the study. Water hardness was 104 mg/L as $CaCO_3$.

	Due to the complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. The initial concentration of the test substance was not maintained at 80% in the highest loading rate throughout the test, 77% of the initial concentration was maintained. It was deemed more appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing, rather than preparing dilutions of a stock solution as outlined in the guideline.
Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	The maximum actual loading rate causing no mortality after 96 hours was 0.47 mg/L. The minimum actual loading rate causing 100% mortality after 96 hours was 1.8 mg/L. The maximum measured concentration causing no mortality after 96 hours was 0.40 mg/L. The minimum measured concentration causing 100% mortality after 96 hours was 1.7 mg/L. Lethal Loading (LL_{50}) / Lethal Concentration (LC_{50}) Values (mg/L) 3 hours: LL_{50} >7.0*, LC_{50} >6.3* 6 hours: LL_{50} 6.8 (CNC), LC_{50} 6.2 (CNC) 24 hours: LL_{50} 2.7 (2.2-3.2), LC_{50} 2.7 (2.2-3.3) 48 hours: LL_{50} 1.8 (1.5-2.2), LC_{50} 1.7 (1.4-2.1) 72 hours: LL_{50} 1.2 (1.1-1.3), LC_{50} 1.1 (1.0-1.2) 96 hours: LL_{50} 1.1 (1.0-1.3), LC_{50} 1.0 (0.9-1.2) * Not a calculated value, 8% mortality was observed in the highest loading rate/concentration tested. Values in parentheses are 95% confidence intervals. CNC = Could Not Calculate The method of analysis was automated static headspace gas chromatography with flame ionization detection (HS GC-FID). Summary of In-Life observations - % Mortality

Loading Rate (mg/L)	Control	0.47	0.90	1.8	3.5	7.0
Meas. Conc. (mg/L)	0	0.40	0.79	1.7	3.7	6.3
3 hours	0	0	0	0	0	8
6 hours	0	0	0	0	0	67
24 hours	0	0	0	8	92	100
48 hours	0	0	0	50	100	100
72 hours	0	0	8	100	100	100
96 hours	0	0	17	100	100	100

Conclusion:	After *Oncorhynchus mykiss* were exposed to WAFs prepared from Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) for 96 hours, the LL_{50} was 1.1 mg/L and the LC_{50} was 1.0 mg/L.
Reliability:	1-Reliable without restrictions.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. FISH, ACUTE TOXICITY TEST on PYROLYSIS C10+ FUEL OIL (FROM PYROLYSIS GASOLINE DISTILLATION). Study # 176958
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Partition Coefficient

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number: CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	EEC A8 / OECD 117
Year (guideline):	1992 / 1989
Type (test type):	N-Octanol/Water Partition Coefficient (HPLC method)
GLP:	Yes
Year (study performed):	2004
Temperature:	25 Deg C
Log P_{ow} Value:	3.3 - 5.4
Test Conditions: • **Note: Concentration prep., vessel type, replication, test conditions.**	Test substance was evaluated at a concentration of 108 mg/L in a mixture of methanol:tetrahydrofuran:water (73:2:25). HPLC analysis was performed on a Hewlett Packard 1050 Liquid Chromatograph with a Luna 5um C8 (15cm x 3mm id) column with a 1 mL/min flow rate (methanol:water (3:1) mobile phase), 10uL injection volume and UV detection at 210 nm. Six reference compounds (with known log P_{ow} values) at concentrations ranging from approximately 42 to 109 mg/L, were analyzed in a combined solution including nitrobenzene (log P_{ow} =1.9), ethylbenzoate (log P_{ow} = 2.6), bromobenzene (log P_{ow}=3.0), benzylbenzoate (log P_{ow}=4.0), triphenylamine (log P_{ow}=5.7) and DDT (log P_{ow}=6.2). Additionally, an unretained standard of 4,5-dihydroxynaphthalene-2,7-disulphonic acid, disodium salt was analyzed to determine the system deadtime. Two sets of reference mixture and test substance runs were performed.
Results: **Units/Value:**	Multiple components detected with Log P_{ow} values between 3.3 and 5.4 (calculated from the mean exponential regression of reference compounds)
Reliability:	(1) Reliable without restriction
Reference:	Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation). Study EXN078/042054.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Vapor Pressure

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number: CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. Residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	EEC A4 / OECD 104
Year (guideline):	1992 / 1995
Type (test type):	Vapor Pressure (static measurement procedure)
GLP:	Yes
Year (study performed):	2004
Temperature:	25 Deg C
Vapor Pressure Value:	400 Pa
Test Conditions: • **Note: Concentration prep., vessel type, replication, test conditions.**	Test conducted at five temperatures between 303 and 343 Deg K (30 and 70 Deg C). Actual test temperatures were 303.15, 313.15, 323.15, 333.15 and 343.15. Duplicate measurements made at each temperature.
Results: **Units/Value:**	Mean vapor pressures were as follows: 490 Pa at 303.15 Deg K 750 Pa at 313.15 Deg K 1220 Pa at 323.15 Deg K 1730 Pa at 333.15 Deg K 2320 Pa at 343.15 Deg K 400 Pa at 25 Deg C (calculated from linear regression)
Reliability:	(1) Reliable without restriction
Reference:	Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation). Study EXN078/042054.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Boiling Point

Test Substance:

Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation)

CAS Number:	CAS Inventory Name:
68513-69-9	Residues, petroleum, steam-cracked light
68921-67-5	Hydrocarbons, ethylene-manuf.-by-product distn. residues

This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.

Method/Guideline: EEC A2 / OECD 103

Year (guideline): 1992 / 1995

Type (test type): Boiling Point (distillation method)

GLP: Yes

Year (study performed): 2004

Pressure Corrected to Standard Atmospheric

Boiling Point Value: 114 - 248 Deg C

Test Conditions:

- **Note: Concentration prep., vessel type, replication, test conditions.**

Test substance added to distillation flask and heated at a rate which resulted in initial drops of distillate condensing after 10-15 minutes. On boiling, the heating rate was adjusted in order that the distillation rate was approximately 3 mL/min. Procedure performed in duplicate.

Results:

Units/Value:

Results of duplicate measurements:

Run I	initial B.P. 115 Deg C	final B.P. 249 Deg C
Run II	initial B.P 113 Deg C	final B.P. 247 Deg C

Mean 114 - 248 Deg C

A small amount of thick brown residue remained in the flask at the end of the test.

Reliability: (1) Reliable without restriction

Reference: Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation). Study EXN078/042054.

Other (source): Olefins Panel, American Chemistry Council

Robust Summary
Vapor Pressure

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number: CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. Residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution of from C9 or C10 to hydrocarbons boiling at 650 F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	EEC A4 / OECD 104
Year (guideline):	1993 / 1995
Type (test type):	Vapor Pressure (static measurement procedure)
GLP:	Yes
Year (study performed):	2004
Temperature:	25 Deg C
Vapor Pressure Value:	400 Pa
Test Conditions: • **Note: Concentration prep., vessel type, replication, test conditions.**	Test conducted at five temperatures between 303 and 343 Deg K (30 and 70 Deg C). Actual test temperatures were 303.15, 313.15, 323.15, 333.15 and 343.15. Duplicate measurements made at each temperature.
Results: **Units/Value:**	Mean vapor pressures were as follows: 490 Pa at 303.15 Deg K 750 Pa at 313.15 Deg K 1220 Pa at 323.15 Deg K 1730 Pa at 333.15 Deg K 2320 Pa at 343.15 Deg K 400 Pa at 25 Deg C (calculated from linear regression)
Reliability:	(1) Reliable without restriction
Reference:	Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation). Study EXN078/042054.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Partition Coefficient

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number: CAS Inventory Name: 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution of from C9 or C10 to hydrocarbons boiling at 650 F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	EEC A8 / OECD 117
Year (guideline):	1993 / 1989
Type (test type):	N-Octanol/Water Partition Coefficient (HPLC method)
GLP:	Yes
Year (study performed):	2004
Temperature:	25 Deg C
Log P_{ow} Value:	3.3 - 5.4
Test Conditions: • **Note: Concentration prep., vessel type, replication, test conditions.**	Test substance was evaluated at a concentration of 108 mg/L in a mixture of methanol:tetrahydrofuran:water (73:2:25). HPLC analysis was performed on a Hewlett Packard 1050 Liquid Chromatograph with a Luna 5um C8 (15cm x 3mm id) column with a 1 mL/min flow rate (methanol:water (3:1) mobile phase), 10uL injection volume and UV detection at 210 nm. Six reference compounds (with known log P_{ow} values) at concentrations ranging from approximately 42 to 109 mg/L, were analyzed in a combined solution including nitrobenzene (log P_{ow} =1.9), ethylbenzoate (log P_{ow} = 2.6), bromobenzene (log P_{ow}=3.0), benzylbenzoate (log P_{ow}=4.0), triphenylamine (log P_{ow}=5.7) and DDT (log P_{ow}=6.2). Additionally, an unretained standard of 4,5-dihydroxynaphthalene-2,7-disulphonic acid, disodium salt was analyzed to determine the system deadtime. Two sets of reference mixture and test substance runs were performed.
Results: **Units/Value:**	Multiple components detected with Log P_{ow} values between 3.3 and 5.4 (calculated from the mean exponential regression of reference compounds)
Reliability:	(1) Reliable without restriction
Reference:	Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation). Study EXN078/042054.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Alga Toxicity

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number / CAS Inventory Name 68513-69-9 Residue, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	OECD Guideline 201
Year (guideline):	1984
Type (test type):	Alga Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Pseudokirchneriella subcapitata*
Analytical Monitoring:	Yes
Exposure Period:	96 hours
Statistical Method:	The E_bC_{50}, E_rC_{50} and confidence intervals for inhibition of growth/growth rate slope were determined by a probit regression calculation of the probit of the growth inhibition/growth rate slope vs the log of the concentration and associated confidence intervals based on the methods of D. J. Finney (Finney, 1971). Calculations were based on the PROC PROBIT procedure of SAS (SAS, 2002). The NOEC for the E_bC_{50} and E_rC_{50} was based on Multiple Range tests (Duncan's, 1975) and (Dunnett's, 1964), determined from the GLM procedure of SAS (SAS, 2002). The Shapiro-Wilk (Shapiro-Wilk, 1965) test for normality was used to test if the assumption of normality of the residuals was met; since the residuals were normally distributed the NOEC was based on the estimated values. Finney, D.J. 1971. *Probit Analysis*, 3rd Edition, London: Cambridge University Press. SAS Version 8, SAS Institute, Inc., Cary, NC. 2002. Duncan, D.B. 1975, "t-Tests and Intervals for Comparisons Suggested by the Data", Biometrics, 31, 339-359. Dunnett, C. 1964, "New Tables for Multiple Comparisons With A Control", Biometrics, Vol 20, No. 3, pg 482-491. Shapiro, S.S. and Wilk, M.B. 1965,"n analysis of variance test for normality (complete samples)" Biometrika, 52, pg 591-611.

Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 4.0 L of algal nutrient medium augmented with sodium bicarbonate in glass aspirator bottles (capacity 4.5 L). The solutions were mixed for 24 hours using a 7% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into 12 replicates of approximately 140 mL in 125 mL Erlenmeyer flasks (no headspace) containing two 14 mm glass spheres to facilitate mixing. The test chambers were inoculated with algae (1.0×10^4 cells/mL) and were sealed with ground glass stoppers. Three replicates were sacrificed daily for cell density determination. The test chambers were placed on a shaker table (100 rpm) to keep the algae in suspension. The test was performed under static conditions with no aeration. The algae was cultured in-house from 5 day old stock cultures in log phase growth. Mean test temperature: 24.5°C (sd = 0.3). Continuous light: intensity was 8288 to 8589 Lux. The pH ranged from 7.5 to 7.6 in the test solutions at test initiation and ranged from 7.8 to 9.5 at test termination. Due to the complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. Test substance analysis was performed on samples of the WAFs at the start of the test (day 0) and at termination (day 4). The initial concentration of the test substance was not maintained at 80% in the three lower loading rates throughout the test (this may be due to biological activity or physical processes in the test chambers). It was appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing, rather than preparing dilutions of a stock solution as outlined in the guideline. The test duration was 96 hours, instead of 72 hours. However, both 72 and 96-hour endpoints were determined. None of the above exceptions are believed to have affected the outcome, integrity, or quality of the study.
Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	Effects on growth rate (r) based upon actual loading rates: 72 hr ErL50 = 2.3 mg/L (2.2 - 2.4 mg/L) 96 hr ErL50 = 2.2 mg/L (2.1 - 2.3 mg/L) 72 hr and 96 hour NOELR = 0.18 mg/L Effects on biomass (b) based upon actual loading rates: 72 hr EbL50 = 1.3 mg/L (1.1 - 1.5 mg/L) 96 hr EbL50 = 1.2 mg/L (CNC) 72 hr and 96 hour NOELR = 0.18 mg/L Effects on growth rate (r) based upon measured concentrations: 72 hr ErC50 = 1.7 mg/L (1.6 - 1.8 mg/L) 96 hr ErC50 = 1.6 mg/L (1.5 - 1.7 mg/L) 72 hr and 96 hour NOEC = 0.12 mg/L Effects on biomass (b) based upon measured concentrations: 72 hr EbC50 = 0.95 mg/L (0.80 - 1.1 mg/L) 96 hr EbC50 = 0.91 mg/L (CNC) 72 hr and 96 hour NOEC = 0.12 mg/L Values in parentheses are 95% confidence intervals. CNC = Could Not Calculate

	The analytical method used was static headspace gas chromatography with flame ionization detection. Summary of In-Life observations - % Inhibition Loading Rate (mg/L) Control 0.10 0.18 0.46 1.3 3.3 Meas. Conc. (mg/L) 0 0.04 0.12 0.36 0.99 2.4 Based on Growth Rate 72 hours n/a 0 -1.9 6.1 17 84 96 hours n/a 0 -2.9 1.1 18 88 Based on Biomass 72 hours n/a -1.0 -1.6 26 51 95 96 hours n/a -0.3 -7.1 16 60 98 Negative (-) value indicates a stimulatory effect.
Conclusions:	Effects on growth rate (r) based upon actual loading rates: 72 hr ErL50 = 2.3 mg/L 96 hr ErL50 = 2.2 mg/L Effects on biomass (b) based upon actual loading rates: 72 hr EbL50 = 1.3 mg/L 96 hr EbL50 = 1.2 mg/L Effects on growth rate (r) based upon measured concentrations: 72 hr ErC50 = 1.7 mg/L 96 hr ErC50 = 1.6 mg/L Effects on biomass (b) based upon measured concentrations: 72 hr EbC50 = 0.95 mg/L 96 hr EbC50 = 0.91 mg/L
Reliability:	(1)-Reliable without restriction
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. ALGA, GROWTH INHIBITION TEST on PYROLYSIS C10+ FUEL OIL (FROM PYROLYSIS GASOLINE DISTILLATION). Study # 176967.
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Biodegradation

Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number / CAS Inventory Name 68513-69-9 / Residues, petroleum, steam-cracked light 68921-67-5 / Hydrocarbon, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution of from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalenes and substituted naphthalenes.
Method/Guideline:	OECD Guideline 301F
Year (guideline):	1992
Type (test type):	Ready Biodegradability: Manometric Respirometry Test
GLP (Y/N):	Yes
Year (study performed):	2003
Inoculum:	Domestic activated sludge
Exposure Period:	28 Days
Test Conditions: • **Note: Concentration preparation, vessel type, replication, test conditions.**	Triplicate test systems were used to evaluate the biodegradability of the test and positive control substances at mean concentrations of 52.67 mg/L and 51.19 mg/L, respectively. Blank test systems, which did not contain the test or positive control substance, were run concurrently in triplicate. The total suspended solids (TSS) of the activated sludge was determined to be 3.32 g/L. The inoculum was added at a 1% loading volume of sludge supernatant to test medium. The microbial count of the inoculum was 10^5 CFU/mL. One liter of test medium, which was aerated for 24 hours with carbon dioxide free air, was added to each one liter respirometer flask. The test substance was weighed in an air tight syringe and injected into the test medium. The test system was sealed immediately after addition of the test substance. An aliquot of the positive control stock solution was added to the appropriate test flasks.

Test Conditions (cont'd): • **Note: Concentration preparation, vessel type, replication, test conditions.**	An unacclimated activated sludge inoculum was used in this study. The inoculum was obtained from the Clinton Sanitary Wastewater Treatment Plant, Annandale, NJ, USA. The treatment plant receives domestic sewage. All test systems were placed on a Coordinated Environmental Services (CES) automated respirometer which automatically recorded the oxygen uptake in general agreement with the OECD guideline. The 28-day study was conducted at a temperature range of 22 ± 1°C.
Results: **Units/Value:** **Note: Deviations from protocol or guideline analytical method.**	Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test substance as calculated using results of an elemental analysis of the test substance. By day 14, >60% biodegradation of positive control was observed, which meets the guideline requirement. No deviations from the protocol occurred that affected the integrity of the study data. No biodegradation was observed in each of the triplicate test substance systems, therefore the test substance cannot be considered readily biodegradable. Sample — % Degradation* (day 28) — Mean % Degradation (day 28) Test Substance — 7, 3, 12 — 7 Na Benzoate — 91, 87, 89 — 89 * replicate data
Conclusion:	Not readily biodegradable
Reliability:	(1)-Reliable without restriction.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2002. Ready Biodegradability: Manometric Respirometry test. Study # 176994A
Other (source): (FT - SO)	Olefins Panel, American Chemistry Council

Robust Summary
Invertebrate Acute Toxicity

Test Substance:	Industry Stream Name (acronym): Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) CAS Number / CAS Inventory Name 68513-69-9 Residues, petroleum, steam-cracked light 68921-67-5 Hydrocarbons, ethylene-manuf.-by-product distn. residues This stream is separated by distillation from pyrolysis gasoline, as a bottoms product. The composition indicates a carbon number distribution from C9 or C10 to hydrocarbons boiling at 650°F or higher. The reported typical composition includes 20% dicyclopentadiene, 30% codimers of C5 and C6 monomers, 20% naphthalene and substituted naphthalenes.
Method/Guideline:	OECD Guideline 202
Year (guideline):	1984
Type (test type):	Daphnid Acute Toxicity Test
GLP (Y/N):	Yes
Year (study performed):	2003
Species:	*Daphnia magna* Straus
Analytical Monitoring:	Yes
Exposure Period:	48 hours
Statistical Method:	The 24 and 48-hour EL_{50} and EC_{50} values were determined using a Binomial Method (Stephan, 1977). Stephan, C. E., Methods for Calculating an LC_{50}, *Aquatic Toxicology and Hazard Evaluation, ASTM STP 634*, F. L. Mayer and J. L. Hamelink, Eds., American Society for Testing and Materials, 1977, pp. 65-84.
Test Conditions: • **Note: Concentration preparation, vessel type, volume, replication, environmental conditions, organisms supplier, loading, deviations from guideline or protocol.**	Individual Water Accommodated Fractions (WAF's) were prepared for each treatment. The test substance was added to 12 L of reconstituted water in glass aspirator bottles (capacity 13.5 L). The solutions were mixed for 24 hours using a 3% vortex (of the static liquid depth). The test solutions were removed through the outlet at the bottom of each mixing vessel into four replicates of approximately 140 mL in 125 mL Erlenmeyer flasks (no headspace). Five daphnids were added to each replicate and the replicates were closed. The test was performed under static conditions with no aeration. Mean test temperature: 20.1°C (S.D. = 0.1), diurnal light: approximately 16 hours light and 8 hours dark with 91 to 135 lux during full daylight periods. Dissolved oxygen ranged from 7.9 to 8.1 mg/L and pH ranged from 8.1 to 8.3 during the study. Water hardness was 144 mg/L as $CaCO_3$. The daphnids were cultured in-house. Age was <24 hours old from 15-day old parents. Due to the relatively complex nature and limited water solubility of the test substance, the following exceptions to the guideline apply for this study: The concentration of the test substance in solution was not determined prior to use. It was deemed more appropriate to prepare individual treatment solutions by adding the test substance to dilution water and removing the WAF of each mixture for testing, rather than preparing dilutions of a stock solution as outlined in the guideline.

Results: **Units/Value:** **Note: Analytical method, biological observations, control survival.**	Effect Loading (EL_{50}) / Effect Concentration (EC_{50}) Values (mg/L) EL_{50} EC_{50} 24 hours 2.7 (1.8-4.1) 2.7 (1.7-4.2) 48 hours 1.2 (0.83-1.8) 1.2 (0.82-1.7) Values in parentheses ( ) are 99% confidence intervals. The maximum actual loading rate causing no immobilization after 48 hours was 0.83 mg/L. The minimum actual loading rate causing 100% immobilization after 48 hours was 1.8 mg/L. The maximum measured concentration causing no immobilization after 48 hours was 0.82 mg/L. The minimum measured concentration causing 100% immobilization after 48 hours was 1.7 mg/L. The method of analysis was automated static headspace gas chromatography with flame ionization detection (HS GC-FID).

Loading Rate (mg/L)	Measured Conc. (mg/L)	% Immobilization 24-hour	48-hour
Control	0	0	0
0.17	0.07	0	0
0.33	0.14	0	0
0.83	0.82	0	0
1.8	1.7	0	100
4.1	4.2	100	100

Conclusion:	After *Daphnia magna* were exposed to WAFs prepared from Pyrolysis C10+ Fuel Oil (from Pyrolysis Gasoline Distillation) for 48 hours, the EL_{50} and $EC_{50}$was 1.2 mg/L.
Reliability:	1-Reliable without restrictions.
Reference:	ExxonMobil Biomedical Sciences, Inc. 2004. *Daphnia sp.*, ACUTE IMMOBILIZATION TEST on PYROLYSIS C10+ FUEL OIL (FROM PYROLYSIS GASOLINE DISTILLATION). Study # 176942
Other (source):	Olefins Panel, American Chemistry Council

Robust Summary
Vapor Pressure

Test Substance:

Industry Stream Name (acronym): Heavy Pyrolysis Fuel Oil

CAS Number:	CAS Inventory Name:
68513-69-9	Residues, petroleum, steam-cracked light
64741-62-4	Clarified oils, petroleum, catalytic cracked
69013-21-4	Fuel oil, pyrolysis
8002-05-9	Petroleum

In ethylene plants cracking liquid feedstocks, the cracking furnace effluent (after heat recovery) is quenched by injection of recycled quench oil. This step results in the condensation of higher boiling hydrocarbon compounds that are typically separated from the rest of the furnace effluent as the bottoms of the oil quench tower. Lights are stripped from the excess oils generated from this quench system, resulting in the stream identified here as heavy pyrolysis fuel oil.

Method/Guideline: EEC A4 / OECD 104

Year (guideline): 1992 / 1995

Type (test type): Vapor Pressure (static measurement procedure)

GLP: Yes

Year (study performed): 2004

Temperature: 25 Deg C

Vapor Pressure Value: 210 Pa

Test Conditions:

- **Note: Concentration prep., vessel type, replication, test conditions.**

Test conducted at five temperatures between 303 and 343 Deg K (30 and 70 Deg C). Actual test temperatures were 303.15, 313.15, 323.15, 333.15 and 343.15. Duplicate measurements made at each temperature.

Results:

Units/Value:

Mean vapor pressures were as follows:

260 Pa at 303.15 Deg K
510 Pa at 313.15 Deg K
780 Pa at 323.15 Deg K
1240 Pa at 333.15 Deg K
1750 Pa at 343.15 Deg K

210 Pa at 25 Deg C (calculated from linear regression)

Reliability: (1) Reliable without restriction

Reference: Huntingdon Life Sciences, Ltd. 2004, Physicochemical Properties for Heavy Pyrolysis Fuel Oil. Study EXN077/042053.

Other (source): Olefins Panel, American Chemistry Council